Report on Chlorophyll *a* Distribution along the Course of the FUJI in 1981–1982

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1981–1982 年「ふじ」航路におけるクロロフィル *a* 量分布報告

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要旨: 1981–1982 年，第 23 次日本南極地域観測隊の海洋生物定常観測として，「ふじ」船上で行われたクロロフィル *a* 量の測定結果を報告する．

Abstract: Data on chlorophyll *a* concentrations measured on board the FUJI as part of the marine biological programme of the 23rd Japanese Antarctic Research Expedition in 1981–1982 are presented.

Chlorophyll *a* concentrations of surface and subsurface waters were measured on board the icebreaker FUJI as part of the marine biological programme of the 23rd Japanese Antarctic Research Expedition in 1981–1982. Chlorophyll *a* concentration was determined by both the fluorometric and colorimetric methods, using a Shimadzu model RF-500 spectrofluorometer and a HITACHI model 101 spectrophotometer, respectively. A regression of chlorophyll *a* determined by the fluorometric method (Y) on chlorophyll *a* determined by the colorimetric method (X) was $Y=0.8507X-0.0278$ ($r=0.950$). Data obtained by the fluorometric method are presented in this report.

Surface chlorophyll *a* concentration was measured two to four times a day at 0800, 1300, 1800 and 2300 by the local time along the cruise track of the FUJI between Tokyo and Syowa Station (69°00′S, 39°35′E), Antarctica. A total of 135 stations was occupied between 27 November 1981 and 15 April 1982. The results of measurements are summarized in Table 1 and the surface distribution of chlorophyll *a* is shown in Fig. 1. Subsurface chlorophyll *a* was measured at seven stations in the Indian sector of the Antarctic Ocean between 22 February and 4 March 1982. Water samples from 11 layers down to 200 m depth were collected by the Nansen bottles. The results are listed in Table 2 and the vertical distributions of chlorophyll *a* are shown in Fig. 2.

Acknowledgments

We are indebted to Prof. T. HOSHIAI (National Institute of Polar Research), leader of the JARE-23, and to Captain S. TAKEUCHI of the icebreaker FUJI.

(*Received January 13, 1984*)

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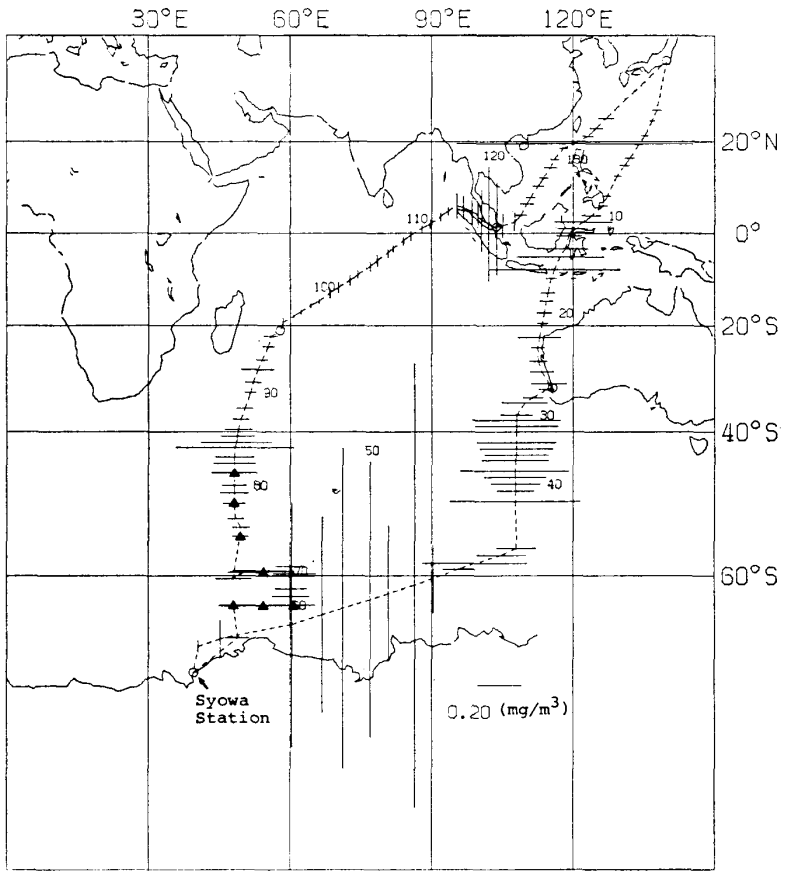

Fig. 1. Surface chlorophyll a distribution (——) along the cruise track of the FUJI (------) in 1981–1982. Numeral indicates the serial number of the sampling station. Seven triangles indicate stations at which subsurface chlorophyll a concentrations were measured.

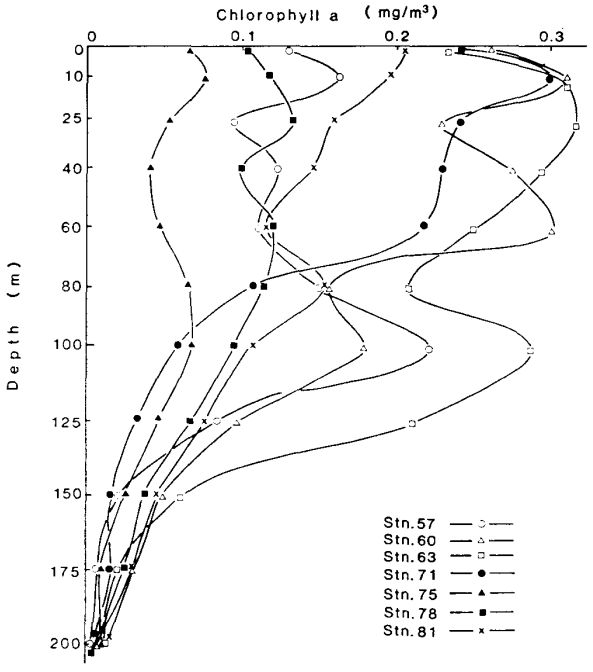

Fig. 2. Vertical distribution of chlorophyll a at seven stations in the Indian sector of the Antarctic Ocean in February and March 1982 (Stn. 57: 63°02′S, 48°00′E; Stn. 60: 63°00′S, 53°00′E; Stn. 63: 63°00′S, 60°06′E; Stn. 71: 59°26′S, 53°27′E; Stn. 75: 55°16′S, 49°28′E; Stn. 78: 51°04′S, 48°06′E; Stn. 81: 46°40′S, 48°16′E).

Table 1. Data on surface chlorophyll a concentrations and water temperature observed aboard the FUJI between Tokyo and Syowa Station, Antarctica, in 1981–1982.

Station No.	Date	Time	Latitude	Longitude	Chlorophyll *a* (mg/m^3)	Water temp. (°C)
	1981					
1	Nov. 27	800	26°18′N	137°47′E	0.04	24.1
2	27	1800	24 11	136 49	0.02	25.2
3	28	800	21 13	135 15	0.03	25.9
4	28	1800	19 23	133 55	0.03	27.1
5	29	800	16 26	132 04	0.04	28.4
6	29	1800	14 48	130 59	0.04	28.5
7	30	800	12 29	129 23	0.03	28.3
8	Dec. 1	800	08 20	127 17	0.03	29.1
9	1	1800	06 10	126 18	0.04	29.0
10	2	800	04 00	123 51	0.09	29.0
11	2	1800	02 33	122 18	0.27	28.8
12	3	800	01 08	120 03	0.14	28.8
13	3	1800	00°40′S	119 13	0.12	29.4
14	4	800	03 29	118 26	0.21	29.0
15	4	1800	05 19	117 16	0.41	28.8
16	5	800	08 00	116 03	0.61	28.0
17	5	1800	09 54	115 23	0.05	28.8
18	6	800	12 57	114 43	0.06	27.8
19	6	1800	14 44	114 19	0.06	28.3
20	7	800	17 22	113 52	0.07	26.4
21	7	1800	19 32	113 28	0.05	25.6
22	8	800	22 29	112 52	0.20	23.2
23	8	1800	24 24	112 30	0.06	23.0
24	9	800	27 06	112 45	0.08	22.2
25	9	1800	29 07	113 25	0.11	22.8
26	10	800	31 20	114 59	0.16	20.3
Fremantle						
27	16	1800	32 32	114 22	0.07	18.5
28	17	815	33 59	111 36	0.09	17.7
29	17	1800	35 00	109 46	0.21	14.4
30	18	800	37 09	108 02	0.15	15.4
31	18	1300	38 06	108 01	0.41	13.0
32	18	1800	39 04	108 01	0.39	12.1
33	18	2300	40 02	107 59	—	11.8
34	19	800	41 47	108 00	0.37	11.4
35	19	1300	42 46	107 59	0.34	10.7
36	19	1800	43 45	107 59	0.30	10.2
37	19	2300	44 38	107 43	0.31	10.1
38	20	800	46 26	107 47	0.51	9.5
39	20	1300	47 23	107 49	0.29	6.4
40	20	1800	48 22	107 52	0.23	6.6
41	20	2300	49 23	107 52	0.17	4.9
42	21	800	50 50	107 45	0.61	2.8
43	23	640	56 49	108 00	0.18	0.6
44	23	1730	57 41	104 50	0.23	0.1
45	24	800	58 39	99 12	0.49	0.0
46	24	1730	59 17	95 47	0.15	−0.2

Table 1. (continued).

Station No.	Date	Time	Latitude	Longitude	Chlorophyll *a* (mg/m^3)	Water temp. (°C)
47	Dec. 25	800	60°18′S	90°21′E	0.33	0.0
48	25	1800	60 57	86 27	2.16	−0.6
49	26	800	61 50	80 50	0.66	−0.6
50	26	1800	62 27	76 58	1.34	−0.4
51	27	800	63 20	71 09	1.56	−0.6
52	27	1800	63 59	66 49	0.95	0.3
53	28	800	64 57	60 23	1.19	−0.2
54	30	800	66 16	45 11	0.18	−1.6
55	31	700	66 55	40 29	0.05	−1.2
Ice edge off Syowa Station						
	1982					
56	Feb. 21	1800	66 09	48 50	0.11	−0.3
57	22	930	63 02	48 00	0.13	1.1
58	22	1800	63 00	49 35	0.18	1.2
59	22	2300	63 00	51 12	0.18	1.1
60	23	900	63 00	53 00	0.26	1.2
61	23	1800	62 58	56 12	0.30	0.6
62	23	2300	62 59	57 45	0.29	1.1
63	24	855	63 00	60 06	0.23	0.8
64	24	1800	62 04	60 13	0.17	1.1
65	24	2300	61 18	60 14	0.15	1.4
66	25	800	60 00	60 01	0.23	1.4
67	25	1800	58 55	59 59	0.13	2.1
68	26	800	59 44	60 58	0.20	1.4
69	26	1800	59 29	58 08	0.12	2.0
70	26	2300	59 28	56 21	0.13	2.0
71	27	855	59 26	53 27	0.24	2.0
72	27	1800	59 32	51 41	0.18	2.1
73	27	2300	59 37	50 18	0.15	2.3
74	28	800	60 17	47 59	0.17	2.0
75	Mar. 2	855	55 16	49 28	0.07	2.9
76	2	1800	54 09	49 28	0.08	2.7
77	2	2300	53 04	48 27	0.07	3.6
78	3	845	51 04	48 06	0.10	4.6
79	3	1800	49 39	48 12	0.13	5.0
80	3	2300	48 33	48 12	0.11	6.4
81	4	840	46 40	48 16	0.21	7.3
82	4	1800	45 10	48 09	0.19	8.0
83	4	2300	44 06	48 12	0.18	8.6
84	5	800	42 29	48 17	0.55	11.9
85	5	1300	41 44	48 35	0.33	17.8
86	5	1800	40 42	48 53	0.16	19.7
87	5	2300	39 35	49 03	0.13	19.2
88	6	800	37 55	49 36	0.07	19.7
89	6	1800	35 57	50 27	0.07	21.4
90	7	800	33 05	51 39	0.05	22.7
91	7	1800	31 04	52 16	0.07	24.5
92	8	800	28 37	53 14	0.15	25.0
93	8	1800	26 49	54 09	0.05	26.2

Table 1. (*continued*).

Station No.	Date	Time	Latitude	Longitude	Chlorophyll *a* (mg/m^3)	Water temp. (°C)
94	Mar. 9	800	24°11′S	55°20′E	0.05	26.8
95	9	1800	22 14	55 55	0.06	28.2
Port Louis						
96	17	1800	19 19	58 31	0.04	27.2
97	18	800	18 00	60 42	0.01	27.6
98	18	1800	17 03	62 14	0.02	28.4
99	19	800	15 42	64 18	0.02	27.8
100	19	1800	14 45	66 05	0.02	27.7
101	20	800	12 57	68 29	0.05	28.0
102	20	1800	11 50	70 15	0.05	28.6
103	21	800	10 16	72 38	0.04	28.4
104	21	1800	09 05	74 24	0.03	28.8
105	22	800	07 19	76 56	0.04	28.8
106	22	1800	06 02	78 28	0.05	29.1
107	23	800	04 21	80 43	0.04	28.5
108	23	1800	03 27	81 49	0.03	28.9
109	24	800	01 41	84 06	0.04	28.8
110	24	1800	00 28	85 44	0.05	30.2
111	25	800	01°06′N	87 59	0.04	28.9
112	25	1800	02 11	89 42	0.04	29.3
113	26	800	03 48	91 55	0.04	28.9
114	26	1800	05 01	93 29	0.04	30.0
115	27	800	06 10	95 18	0.12	29.4
116	27	1800	05 45	96 46	0.11	29.7
117	28	800	04 52	98 33	0.13	29.1
118	28	1800	04 07	99 48	0.13	29.7
119	30	800	03 04	100 34	0.31	29.4
120	30	1800	02 07	102 05	0.55	29.1
121	31	800	01 11	103 50	0.45	28.9
Singapore						
122	Apr. 8	1800	01 43	105 05	0.12	29.6
123	9	800	02 40	107 37	0.09	29.4
124	9	1800	04 11	108 57	0.05	29.2
125	10	800	06 37	110 14	0.06	28.6
126	10	1800	08 05	111 00	0.04	28.4
127	11	800	10 29	112 36	0.05	28.1
128	11	1800	12 06	113 46	0.04	27.6
129	12	800	14 19	115 14	0.06	28.2
130	12	1800	16 09	116 06	0.04	26.3
131	13	800	18 33	118 03	0.04	25.0
132	13	1800	19 34	120 16	1.12	24.7
133	14	800	21 10	123 10	0.05	23.9
134	14	1800	22 48	124 54	0.06	23.4
135	15	800	24 49	127 03	0.07	22.0

Table 2. Data on subsurface chlorophyll a, phaeophytin and pigment ratio observed at seven stations in the Indian sector of the Antarctic Ocean in February and March 1982.

Station No.	Date Time	Position	Depth (m)	Chl. *a* (mg/m^3)	Phaeopigments (mg/m^3)	Pigment ratio (%)
57	1982 Feb. 22	63°02′S	0	0.13	0.07	65.6
	0930	48°00′E	10	0.16	0.07	69.0
			25	0.09	0.13	42.1
			39	0.12	0.09	56.7
			59	0.11	0.03	76.1
			79	0.15	0.15	50.1
			98	0.22	0.21	51.0
			123	0.08	0.12	40.6
			148	0.02	0.01	25.0
			172	0.01	0.06	9.7
			197	0.00	0.09	1.8
60	1982 Feb. 23	63°00′S	0	0.26	0.14	65.5
	0900	53°00′E	10	0.31	0.12	71.7
			24	0.23	0.12	65.5
			39	0.28	0.07	79.2
			58	0.30	0.01	97.0
			78	0.16	0.08	64.8
			97	0.18	0.12	59.3
			122	0.10	0.11	46.7
			146	0.05	0.06	43.7
			171	0.03	−0.01	—
			195	0.00	0.06	7.3
63	1982 Feb. 24	63°00′S	0	0.23	0.16	58.9
	0855	60°06′E	10	0.31	0.56	35.6
			24	0.32	0.45	41.6
			39	0.30	0.48	37.9
			58	0.25	0.38	40.2
			77	0.21	0.32	39.2
			97	0.29	0.47	38.0
			121	0.21	0.34	38.2
			145	0.06	0.07	46.1
			169	0.02	0.07	21.8
			193	0.01	0.06	12.1
71	1982 Feb. 27	59°26′S	0	0.24	0.09	72.3
	0855	53°27′E	10	0.30	0.05	84.6
			24	0.24	0.06	79.0
			39	0.23	0.10	70.4
			58	0.22	0.11	67.4
			78	0.11	0.11	49.5
			97	0.06	0.06	50.3
			121	0.03	0.08	29.1
			146	0.02	0.01	72.8
			170	0.01	0.01	58.2
			194	0.00	0.01	43.7

Table 2. (continued).

Station No.	Date Time	Position	Depth (m)	Chl. *a* (mg/m^3)	Phaeopigments (mg/m^3)	Pigment ratio (%)
75	1982 Mar. 2	55°16′S	0	0.07	0.02	76.3
	0855	49°28′E	9	0.08	0.03	69.9
			23	0.06	0.04	58.2
			38	0.04	0.06	43.7
			56	0.05	0.05	48.5
			75	0.07	0.04	61.1
			94	0.07	0.04	62.6
			117	0.05	0.02	72.8
			141	0.03	0.02	58.2
			164	0.01	0.05	17.5
			188	0.01	0.02	29.1
78	1982 Mar. 3	51°04′S	0	0.10	0.05	69.1
	0845	48°06′E	10	0.12	0.06	65.5
			25	0.14	0.08	61.9
			40	0.10	0.09	53.9
			59	0.12	0.05	69.1
			79	0.12	0.00	96.6
			99	0.10	0.02	80.7
			124	0.07	0.13	34.8
			149	0.04	0.03	55.8
			173	0.02	0.04	34.0
			198	0.01	0.03	21.8
81	1982 Mar. 4	46°40′S	0	0.21	0.12	63.5
	0840	48°16′E	9	0.20	0.12	61.7
			22	0.16	0.06	72.8
			35	0.15	0.07	67.0
			53	0.12	0.08	59.8
			71	0.15	0.07	69.9
			88	0.11	0.12	47.1
			110	0.08	0.15	34.0
			132	0.05	0.13	27.3
			155	0.03	0.10	24.3
			177	0.01	0.03	29.1